Fermilab

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Director's Office

December 19, 2003

Dr. Gary Feldman
Department of Physics
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Dear Gary,

Thank you for your presentation at the recent meeting of the Fermilab Physics Advisory Committee. The Committee had the following comments:

The Committee reviewed a progress report on the P-929 proposal for an Off-Axis detector to study the $\nu_\mu \rightarrow \nu_e$ oscillations in the NuMI beam line. This can potentially become the future flagship experiment in an exciting neutrino physics program at Fermilab. This experiment is projected to be capable of a $>3\sigma$ detection of ν_e appearance for $\sin^2(2\theta_{13}) > 0.02$ with an initial phase of 20×10^{20} protons on target. More importantly, this experiment also has promising prospects to address the neutrino mass hierarchy and CP-violation phase of the neutrino mixing.

The Off-Axis Collaboration has made significant strides on the detector technology choice, simulation, and cost estimate for the 50kT far detector. The choices for the detector technology have been narrowed down to sampling detectors that make use of scintillator or resistive plate chambers, with comparable costs. The liquid scintillator option is currently considered as the baseline choice with a lower cost. Suitable sites for the far-detector at ~780-850km from Fermilab have also been located. The plan for the near detector(s) is not yet available.

To converge on a complete proposal, the Off-Axis Collaboration is actively pursuing improved simulation and detector R&D to evaluate the performance and cost of the detector technologies, as well as other cost-sensitive issues such as the need for detector overburden to reduce background from cosmic rays. The Committee is excited about the physics prospects of this experiment, and recognizes the importance of the R&D work and improved simulation on the detector design leading to a formal proposal. It is encouraging that the NuMI beamline is on schedule and is expected to be available in 14 months. Although the prospects for achieving the improvement in proton intensity required for this experiment are not known yet, the Committee is interested in hearing what the technically limited schedule would look like for the detector.

Given the physics potential of the experiment and the significant detector cost involved, the Committee feels that some assistance from Fermilab for time-critical R&D needs leading to

the proposal are justified. The Committee would like to encourage the collaboration to continue their efforts in optimizing the physics capability of the detector while minimizing the cost. The Committee looks forward to receiving the completed proposal from the Off-Axis Collaboration.

I was also impressed by the progress, and by the prospect of seeing a proposal for an off-axis detector with an enhanced NuMI beam. The Laboratory is working on understanding how best to enhance the capability of the NuMI beam. In the meantime, progress on detector R&D is also important, and the Laboratory, with your help, will focus the available resources on the most time-critical detector R&D.

We look forward to receiving a full proposal. Good luck!

Sincerely,

Michael Witherell

cc: K. Stanfield
H. Montgomery
S. Holmes
J. Appel